

REMARKS/ARGUMENTS

Claims 1, 3 and 4 are rejected under 35 U.S.C. §102(b) as being anticipated by or, in the alternative, under 35 U.S.C. §103(a) as being obvious over Kanno et al. (U.S. Patent No. 5,918,817). Claim 25 is rejected under 35 U.S.C. §103(a) as being unpatentable over Kanno et al. in view of Izumi et al. (U.S. Patent Application Publication No. 2003/0170988).

Claims 1, 3 and 4 are rejected under 35 U.S.C. §103(a) as being unpatentable over Izumi et al. as evidenced by Kanno et al. Claim 25 is rejected under 35 U.S.C. §103(a) as being unpatentable over Izumi et al. in view of Kanno et al.

In response to the Action, claim 1 is being amended by adding the following limitations, which are supported by Fig. 2 and the related descriptions, particularly page 22, line 20-page 23, line 5, in order to clarify differences between the present invention and the inventions of Kanno et al. and Izumi et al.

First, claim 1 now recites that the treatment liquid discharged from the liquid outlet port is sprayed by the gas discharged from the gas outlet port to generate the droplets in an open space between the substrate being treated and the end of the bifluid nozzle as defined by the casing.

Second, claim 1 recites that an opening including the gas outlet port is formed in the casing at that one end of the bifluid nozzle, that is, the end defined by the casing.

By this combination of features, in the non-limiting example of Fig. 2, the discharged gas is “converged on a point spaced a predetermined distance from the gas outlet port 34a.” whereby the liquid droplets are formed outside the casing, i.e., beyond the casing opening including the gas outlet port which is formed at the end of the bifluid nozzle.

Claim 1, as thus amended, is patently distinguishable from the cited prior art.

As already explained in previous submissions, the bifluid nozzle recited in claim 1 is of the so-called “external mixing type,” which was previously emphasized in claim 1 by the limitation wherein the apparatus “... generates the droplets of the treatment liquid outside the casing, by spraying the gas discharged from the gas outlet port over the treatment liquid discharged from the liquid outlet port.”

In the Action (page 4, last two lines), the Examiner has regarded “the area of the atomizing tube 32 between references (c) and (d)” in Fig. 12 of Kanno et al. as the “casing” in claim 1.

The accelerating tube 31 (the area between references (a) and (b)) and the atomizing tube 32 (the area between references (b) and (c) and the area between references (c) and (d) in Fig. 12 are continuous so as to form a single unitary member. It is unreasonable to modify Kanno’s structure by removing the accelerating tube 31, leaving only the area between references (c) and (d), and citing that modified portion of Kanno’s device (which, having been modified by the Examiner based on hindsight, is not itself known to the art) as being the “casing” in claim 1.

All the two-fluid cleaning jet nozzles 10, 20, 30, 40, 50, 60 and 70 of Kanno et al. are of the so-called internal mixing type, in which a treatment liquid and a gas are mixed within the single member to generate droplets.

According to amended claim 1, as mentioned above, the treatment liquid and the gas are mixed to generate droplets in an open space. On the other hand, in the invention of Kanno et al., even if “the area of the atomizing tube 32 between references (c) and (d)” corresponds to a “casing,” droplets are generated within the area of the atomizing tube 32 between reference (b) and (c), which is not an open space.

As further amended, claim 1 recites that an end of the nozzle has an opening including the gas outlet port. On the other hand, in the invention of Kanno et al., the area of the atomizing tube 32 between references (c) and (d) cited by the Examiner is not formed with an opening including a gas outlet port, because the area between references (c) and (d) and the area between references (b) and (c) are continuous.

Furthermore, even if such an opening could be assumed to exist in the area of the atomizing tube 32 between references (c) and (d), that assumed opening would not located at one end of the two-fluid cleaning jet nozzle 30, as now expressly recited in claim 1.

Thus the Kanno et al. references does not teach or suggest the features recited in amended claim 1. The rejections based on Kanno as the primary reference should now be withdrawn.

Claim 1 is also rejected on the basis of Izumi et al. (see item 9 in the Action).

As the Examiner admits (page 7, lines 2-3 in the Action), Izumi et al. do not explicitly teach the claimed droplet diameter. As already explained in previous submissions, recombination of droplets frequently occurs in a bifluid nozzle of the internal mixing type, as compared with a bifluid nozzle of the external mixing type. As a result, the sizes of droplets generated by an internal mixing type bifluid nozzle tend to be much greater than those generated by a bifluid nozzle of the external mixing type.

However, such a difference is not considered in the Office Action. On at least these grounds, it would be unreasonable to combine the invention of Kanno et al., which employs a bifluid nozzle of the internal mixing type, with the invention of Izumi et al. which employs a bifluid nozzle of the external mixing type.

In addition, the volume median diameter of treatment liquid droplets as defined in claim 1 will hardly be obtained by the two-fluid cleaning jet nozzle of Kanno et al., because the narrow and long path in the accelerating tube 31 will significantly promote recombination of droplets. The applicant cannot agree that Kanno et al. teach droplets each having 10 μ m in diameter. The applicant has repeatedly explained this point. The only rebuttal has been the Examiner's speculations about droplet sizes that "must be" produced by the prior art devices. The Examiner's personal ideas about the droplets that "must be" produced in the prior art are no substitute for clear teachings in the references, or in reasonable combinations of the references.

For all the foregoing reasons, claim 1 and its dependent claims 3, 4 and 25 are considered to be patentably distinguishable and allowable over the prior art of record.

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